1. A town has an initial population of 70000. The town's population for the next 9 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	70050	70100	70150	70200	70250	70300	70350	70400	70450

   A. Exponential

   B. Linear

   C. Logarithmic

   D. Non-Linear Power

   E. None of the above

---

2. For the scenario below, model the rate of vibration (cm/s) of the string in terms of the length of the string. Then determine the variation constant k of the model (if possible). The constant should be in terms of cm and s.

   The rate of vibration of a string under constant tension varies based on the type of string and the length of the string. The rate of vibration of string ω decreases as the quartic length of the string increases. For example, when string ω is 3 mm long, the rate of vibration is 38 cm/s.

   A. $k = 4691.36$

   B. $k = 3078.00$

   C. $k = 0.31$

   D. $k = 0.47$

   E. None of the above.

---

3. For the scenario below, use the model for the volume of a cylinder as $V = \pi r^2 h$ to find the coefficient for the model of the new volume $V_{\text{new}} = kr^2 h$.

   Pepsi wants to increase the volume of soda in their cans. They've decided to decrease the radius by 10 percent and decrease the height by

12 percent. They want to model the new volume based on the radius and height of the original cans.

    A. $k = 0.00120$

    B. $k = 2.23933$

    C. $k = 0.00377$

    D. $k = 0.71280$

    E. None of the above.

---

4. A town has an initial population of 100000. The town's population for the next 9 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	100000	99986	99978	99972	99967	99964	99961	99958	99956

    A. Logarithmic

    B. Linear

    C. Exponential

    D. Non-Linear Power

    E. None of the above

---

5. For the scenario below, model the rate of vibration (cm/s) of the string in terms of the length of the string. Then determine the variation constant k of the model (if possible). The constant should be in terms of cm and s.

The rate of vibration of a string under constant tension varies based on the type of string and the length of the string. The rate of vibration of string ω increases as the square length of the string decreases. For example, when string ω is 2 mm long, the rate of vibration is 39 cm/s.

    A. $k = 9.75$

    B. $k = 1.56$

C. $k = 156.00$

D. $k = 975.00$

E. None of the above.

---

6. For the scenario below, find the variation constant k of the model (if possible).

In an alternative galaxy, the cube of the time, T (Earth years), required for a planet to orbit Sun χ decreases as the quartic of the distance, d (AUs), that the planet is from Sun χ decreases. For example, when Ea's average distance from Sun χ is 9, it takes 78 Earth days to complete an orbit.

A. $k = 72.329$

B. $k = 2.467$

C. $k = 4.028$

D. $k = 3113535672.000$

E. Unable to compute the constant based on the information given.

---

7. For the scenario below, find the variation constant k of the model (if possible).

In an alternative galaxy, the quartic of the time, T (Earth years), required for a planet to orbit Sun χ decreases as the cube of the distance, d (AUs), that the planet is from Sun χ decreases. For example, when Ea's average distance from Sun χ is 6, it takes 73 Earth days to complete an orbit.

A. $k = 131473.338$

B. $k = 6134020056.000$

C. $k = 4.028$

D. $k = 1.609$

E. Unable to compute the constant based on the information given.

8. Choose the model type that would best describe the scenario below.

    Social distancing is a common tactic to counter potential epidemics. This is due to the exponential increase in number of people infected as the density of people living in an area increases.

    A. Direct variation

    B. Joint variation

    C. Indirect variation

    D. None of the above

9. For the scenario below, use the model for the volume of a cylinder as $V = \pi r^2 h$ to find the coefficient for the model of the new volume $V_{\text{new}} = k r^2 h$.

    Pepsi wants to increase the volume of soda in their cans. They've decided to increase the radius by 14 percent and decrease the height by 10 percent. They want to model the new volume based on the radius and height of the original cans.

    A. $k = 0.00616$

    B. $k = 0.00196$

    C. $k = 3.67453$

    D. $k = 1.16964$

    E. None of the above.

10. Choose the model type that would best describe the scenario below.

    Social distancing is a common tactic to counter potential epidemics. This is due to the exponential increase in number of people infected as the density of people living in an area increases.

    A. Joint variation

B. Direct variation

C. Indirect variation

D. None of the above

---

11. A town has an initial population of 80000. The town's population for the next 9 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	80052	80098	80144	80206	80252	80298	80344	80406	80452

A. Logarithmic

B. Exponential

C. Linear

D. Non-Linear Power

E. None of the above

---

12. For the scenario below, model the rate of vibration (cm/s) of the string in terms of the length of the string. Then determine the variation constant k of the model (if possible). The constant should be in terms of cm and s.

The rate of vibration of a string under constant tension varies based on the type of string and the length of the string. The rate of vibration of string ω increases as the quartic length of the string decreases. For example, when string ω is 2 mm long, the rate of vibration is 27 cm/s.

A. $k = 16875.00$

B. $k = 1.69$

C. $k = 432.00$

D. $k = 0.04$

E. None of the above.

---

13. For the scenario below, use the model for the volume of a cylinder as $V = \pi r^2 h$ to find the coefficient for the model of the new volume $V_{\text{new}} = kr^2 h$.

Pepsi wants to increase the volume of soda in their cans. They've decided to decrease the radius by 10 percent and increase the height by 13 percent. They want to model the new volume based on the radius and height of the original cans.

  A. $k = 0.00408$

  B. $k = 0.00130$

  C. $k = 2.87550$

  D. $k = 0.91530$

  E. None of the above.

14. A town has an initial population of 50000. The town's population for the next 9 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	49960	49920	49880	49840	49800	49760	49720	49680	49640

  A. Exponential

  B. Logarithmic

  C. Linear

  D. Non-Linear Power

  E. None of the above

15. For the scenario below, model the rate of vibration (cm/s) of the string in terms of the length of the string. Then determine the variation constant k of the model (if possible). The constant should be in terms of cm and s.

The rate of vibration of a string under constant tension varies based on the type of string and the length of the string. The rate of vibration

of string ω increases as the cube length of the string decreases. For example, when string ω is 3 mm long, the rate of vibration is 25 cm/s.

   A. $k = 675.00$

   B. $k = 0.93$

   C. $k = 0.67$

   D. $k = 925.93$

   E. None of the above.

16. For the scenario below, find the variation constant k of the model (if possible).

   In an alternative galaxy, the square of the time, T (Earth years), required for a planet to orbit Sun χ decreases as the cube of the distance, d (AUs), that the planet is from Sun χ decreases. For example, when Ea's average distance from Sun χ is 10, it takes 100 Earth days to complete an orbit.

   A. $k = 10000000.000$

   B. $k = 10.000$

   C. $k = 4.642$

   D. $k = 4.028$

   E. Unable to compute the constant based on the information given.

17. For the scenario below, find the variation constant k of the model (if possible).

   In an alternative galaxy, the cube of the time, T (Earth years), required for a planet to orbit Sun χ increases as the square of the distance, d (AUs), that the planet is from Sun χ increases. For example, when Ea's average distance from Sun χ is 4, it takes 90 Earth days to complete an orbit.

   A. $k = 45562.500$

B. $k = 2.241$

C. $k = 4.028$

D. $k = 11664000.000$

E. Unable to compute the constant based on the information given.

---

18. Choose the model type that would best describe the scenario below.

    Social distancing is a common tactic to counter potential epidemics. This is due to the exponential increase in number of people infected as the density of people living in an area increases.

    A. Indirect variation

    B. Joint variation

    C. Direct variation

    D. None of the above

---

19. For the scenario below, use the model for the volume of a cylinder as $V = \pi r^2 h$ to find the coefficient for the model of the new volume $V_{\text{new}} = kr^2 h$.

    Pepsi wants to increase the volume of soda in their cans. They've decided to decrease the radius by 20 percent and increase the height by 14 percent. They want to model the new volume based on the radius and height of the original cans.

    A. $k = 2.29211$

    B. $k = 0.01759$

    C. $k = 0.00560$

    D. $k = 0.72960$

    E. None of the above.

---

20. Choose the model type that would best describe the scenario below.

Social distancing is a common tactic to counter potential epidemics. This is due to the exponential increase in number of people infected as the density of people living in an area increases.

   A. Indirect variation

   B. Direct variation

   C. Joint variation

   D. None of the above

---

21. A town has an initial population of 50000. The town's population for the next 9 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	49980	49960	49940	49920	49900	49880	49860	49840	49820

   A. Linear

   B. Logarithmic

   C. Non-Linear Power

   D. Exponential

   E. None of the above

---

22. For the scenario below, model the rate of vibration (cm/s) of the string in terms of the length of the string. Then determine the variation constant k of the model (if possible). The constant should be in terms of cm and s.

The rate of vibration of a string under constant tension varies based on the type of string and the length of the string. The rate of vibration of string ω increases as the quartic length of the string decreases. For example, when string ω is 5 mm long, the rate of vibration is 20 cm/s.

   A. $k = 1.25$

   B. $k = 320.00$

C. $k = 12500.00$

D. $k = 0.03$

E. None of the above.

---

23. For the scenario below, use the model for the volume of a cylinder as $V = \pi r^2 h$ to find the coefficient for the model of the new volume $V_{\text{new}} = kr^2 h$.

Pepsi wants to increase the volume of soda in their cans. They've decided to increase the radius by 15 percent and decrease the height by 18 percent. They want to model the new volume based on the radius and height of the original cans.

A. $k = 1.08445$

B. $k = 0.00405$

C. $k = 0.01272$

D. $k = 3.40690$

E. None of the above.

---

24. A town has an initial population of 100000. The town's population for the next 9 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	100040	100080	100120	100160	100200	100240	100280	100320	100

A. Logarithmic

B. Linear

C. Exponential

D. Non-Linear Power

E. None of the above

25. For the scenario below, model the rate of vibration (cm/s) of the string in terms of the length of the string. Then determine the variation constant k of the model (if possible). The constant should be in terms of cm and s.

   The rate of vibration of a string under constant tension varies based on the type of string and the length of the string. The rate of vibration of string ω decreases as the cube length of the string increases. For example, when string ω is 3 mm long, the rate of vibration is 36 cm/s.

   A. $k = 1.33$

   B. $k = 972.00$

   C. $k = 1333.33$

   D. $k = 0.97$

   E. None of the above.

26. For the scenario below, find the variation constant k of the model (if possible).

   In an alternative galaxy, the quartic of the time, T (Earth years), required for a planet to orbit Sun χ decreases as the square of the distance, d (AUs), that the planet is from Sun χ decreases. For example, when Ea's average distance from Sun χ is 5, it takes 93 Earth days to complete an orbit.

   A. $k = 4.028$

   B. $k = 1870130025.000$

   C. $k = 2992208.040$

   D. $k = 1.389$

   E. Unable to compute the constant based on the information given.

27. For the scenario below, find the variation constant k of the model (if possible).

In an alternative galaxy, the cube of the time, T (Earth years), required for a planet to orbit Sun χ increases as the cube of the distance, d (AUs), that the planet is from Sun χ increases. For example, when Ea's average distance from Sun χ is 3, it takes 76 Earth days to complete an orbit.

A. $k = 2.937$

B. $k = 16258.370$

C. $k = 11852352.000$

D. $k = 4.028$

E. Unable to compute the constant based on the information given.

---

28. Choose the model type that would best describe the scenario below.

In economics, there are two common equations to model interest earned. The compound interest formula is $A = P(1 + \frac{r}{n})^{nt}$, where A is the amount of money you end up with, P is your starting money, r is the interest rate, n is the number of times compounded in a year, and t is the total number of years. For example, if you were a parent and wanted to save $10,000 in 3 years-time at 3.5% interest compounded monthly, you would need to invest about $9,000.

A. Indirect variation

B. Direct variation

C. Joint variation

D. None of the above

---

29. For the scenario below, use the model for the volume of a cylinder as $V = \pi r^2 h$ to find the coefficient for the model of the new volume $V_{\text{new}} = kr^2 h$.

Pepsi wants to increase the volume of soda in their cans. They've decided to decrease the radius by 10 percent and increase the height by

13 percent. They want to model the new volume based on the radius and height of the original cans.

A. $k = 0.00130$

B. $k = 0.91530$

C. $k = 2.87550$

D. $k = 0.00408$

E. None of the above.

30. Choose the model type that would best describe the scenario below.

In economics, there are two common equations to model interest earned. The compound interest formula is $A = P(1 + \frac{r}{n})^{nt}$, where A is the amount of money you end up with, P is your starting money, r is the interest rate, n is the number of times compounded in a year, and t is the total number of years. For example, if you were a parent and wanted to save $10,000 in 3 years-time at 3.5% interest compounded monthly, you would need to invest about $9,000.

A. Joint variation

B. Indirect variation

C. Direct variation

D. None of the above